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FEDERATED SEARCH TOOLS IN FUSION CENTERS: BRIDGING DATABASES IN THE INFORMATION SHARING ENVIRONMENT

by

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September 2012

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FEDERATED SEARCH TOOLS IN FUSION CENTERS: BRIDGIN DATABASES IN THE INFORMATION SHARING ENVIRONMENT

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LIST OF ACRONYMS AND ABBREVIATIONS

9/11	September 11, 2001
9/11 Act	Implementing Recommendations of the 9/11 Commission Act of 2007
BJA	Bureau of Justice Assistance
CIA	Central Intelligence Agency
COC	Critical Operational Capability
COI	Community of Interest
CRS	Congressional Research Service
DCI	Wisconsin Division of Criminal Investigation
DHS	Department of Homeland Security
DoD	Department of Defense
DOJ	Wisconsin Department of Justice
EPIC	El Paso Intelligence Center
FBI	Federal Bureau of Investigation
FIG	Field Intelligence Group
GLOBAL	Global Justice Information Sharing Initiative
HIDTA	High Intensity Drug Trafficking Area
HIR	Homeland Information Reports
HSA	Homeland Security Advisor
HS-SLIC	Homeland Security—State and Local Intelligence Community
HSDN	Homeland Secure Data Network
HSIN	Homeland Security Information Network
HVE	Homegrown Violent Extremist
I&A	Office of Intelligence & Analysis
IC	Intelligence Community
IRTPA	Intelligence Reform and Terrorism Prevention Act
ISE	Information Sharing Environment
ITACG	Interagency Threat Assessment and Coordination Group
JTTF	Joint Terrorism Task Force

LEO	Law Enforcement Online
LES	Law Enforcement Sensitive
MOA	Memorandum of Agreement
NCTC	National Counterterrorism Center
NFCA	National Fusion Center Association
NGA	National Governors Association
NIC	National Intelligence Community
NIE	National Intelligence Estimate
NIS	National Intelligence Strategy for the United States of America
NNFC	National Network of Fusion Centers
NOL-S	NCTC Online SECRET
NSA	National Security Agency
NSI-SAR	Nationwide Suspicious Activity Reporting Initiative
ODNI	Office of the Director of National Intelligence
OSINT	Open Source Intelligence
PERF	Police Executive Research Forum
PM ISE	Program Manager Information Sharing Environment
SAR	Suspicious Activity Report
SBU	Sensitive But Unclassified
SLTTP	State, Local, Tribal, Territorial and Private Sector
STAC	Southeastern Wisconsin Threat Analysis Center
TEW	Terrorism Early Warning Group
TS/SCI	Top Secret/Sensitive Compartmented Information
U.S.	United States
U.S. DOJ	U.S. Department of Justice
U.S. GAO	United States Government Accountability Office
WEM	Wisconsin Emergency Management
WMD	Weapons of Mass Destruction
WSIC	Wisconsin Statewide Information Center
WSP	Wisconsin State Patrol

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I. INTRODUCTION

A. OVERVIEW

The 9/11 Commission, in its report to Congress and the nation, identified a number of critical failures leading up to the attacks on the homeland on September 11, 2001. "Connecting the dots" has become a commonly used phrase within the nation's homeland security and intelligence enterprises; Making associations between those data points and the composite those data represent when viewed in their entirety, is critical to the Homeland Security mission. Such relational analysis is the principal function of fusion centers: Known as state and local information-sharing environments within the Homeland Security Enterprise, fusion center databases represent a considerable resource through which analysis can begin. As fusion centers become more interconnected, and as database accessibility grows, so does the volume of information available to intelligence analysts.

Intelligence analysis, a U.S. Department of Homeland Security (DHS)-defined Critical Operational Capability or COC, is important to the fusion center mission. Fusion centers are required to maintain COCs to ensure operational efficiency, effectiveness, and relevance within the state and local information-sharing environment. More importantly, a fusion center's ability to analyze information is vital to the overall capability, capacity, and maturity of the national network of fusion centers (NNFC), a substantial node within the national intelligence community. Access to databases and the information they contain ensures that intelligence analysis is whole—a process which may involve the synthesis of disparate pieces of data and the subsequent evaluation of the data for relevance and reliability. If a timely response is required, a fusion center intelligence analyst may opt to search the first database he/she comes across and therefore discount the value of information contained in other databases. By doing so, prospective relational relevance may be overlooked—associations within and between data, which could prove significant in the overall analysis.

B. PROBLEM SPACE

The notion of the information-sharing environment, when applied to state and major urban area fusion centers, represents a construct whereby information is collected, analyzed, and disseminated. Information sharing, in one sense, refers to the act of one person or agency sharing information with another person or agency. From another angle, information sharing also speaks to the quantity and quality of information being shared, its relevance and the data held by agencies – information stored at the state and local levels that is largely disconnected from the national network. Based on personal experience and observational knowledge, "information silos" persist in the form of databases. The more databases to which a fusion center has access, the more potential for information "silos." Accessing the information, analyzing the relationships between data points and drawing conclusions from that analysis is vitally important to the process of adding local context to a national-level threat stream.

For example, the Wisconsin Statewide Information Center (WSIC), like many other state and major urban area fusion centers, currently struggles with accessing, searching, compiling, collating, analyzing, evaluating, and disseminating vast amounts of data. In part this is because the data might be found in databases located at the fusion center, in off-site stakeholder agencies, or in a variety of classified and unclassified environments. At this time, there are few mechanisms for a fusion center analyst to perform a single automated search of information contained in all of these databases for a particular person, place, thing, or behavior. Unfortunately, an analyst looking to create a report representing a composite of that information would have to search each database individually, wasting precious time and increasing the margin for human error in terms of time constraints and selection bias.

C. RESEARCH QUESTIONS

How can fusion centers integrate federated search tools to bridge disparate databases and enhance the analytical process? What federated search tools are being used; what are some of the planning, requirements gathering, selection, and acquisition

process challenges associated with the integration of a federated search tool; how can fusion centers overcome these challenges and better integrate federated search tools in fusion centers?

D. HYPOTHESIS

The research project began with a number of notions and assumptions regarding how fusion centers have integrated federated search tools. During integration, centers have utilized planning, requirements gathering, selection, and acquisition processes; they have faced challenges; they have developed strategies to overcome those challenges. The goal of this research was to uncover those experiences, innovations and strategies, and explain them in a general way that would prove valuable to other fusion centers faced with similar information sharing and processing needs.

E. SIGNIFICANCE

Research on federated search tools within fusion centers is important for understanding how local policies, processes, and tools impact intelligence analysis and how that analysis is shared with the national network. This research specifically sought "smart practices" within fusion centers and across the national network—solutions that may be applied to other fusion centers.

F. THESIS MAP

The thesis is organized into seven chapters. Following this chapter, Chapter II offers background into the evolution of fusion centers, the development of technology utilized in fusion centers, and relationships between technology and the analytical process. That foundation is then carried to Chapter III, the literature review. The literature review probes a number of federal government strategy, organizational and policy documents designed for fusion centers along with other reports, reviews, and industry specifications. Chapter IV lays out the research methodology: a hybrid approach rooted in smart practice exploration and survey design informed through an appreciative inquiry optic. This methodology sought to demonstrate how federated search tools are

being integrated in fusion centers to enhance the analytical process. Analysis of the data collected from the survey is found in Chapter V. A constant comparison method for qualitative analysis was layered on the overall research methodology—a strategy that sought to develop themes within narrative stories, identify relationships within those themes and provide a means for those stories to be told in a meaningful way. Chapter VI presents the findings from the data analysis, linking impressions and experiences back to the problem space and research question. Chapter VII offers recommendations and conclusions drawn from the findings sets forth an implementation strategy and provides insight into future research.

II. BACKGROUND

A. INTRODUCTION

Chapter II will detail the evolution of information sharing and intelligence analysis enabled by technology in fusion centers. A number of organizational and technical developments will be discussed. This history will serve as a basis for discussing the introduction of analytical tools in fusion centers, the integration of federated search tools, challenges to those integration processes, and mitigation strategies developed to overcome those challenges.

To begin, Chapter II will navigate the reader through pre-9/11 activities, the post-9/11 response to information sharing failures and the many challenges to follow. A brief discussion will describe how the state and local information sharing environment evolved within the larger intelligence community architecture. Attention will also be drawn to the Department of Homeland Security (DHS) and its roles within the more conceptual "homeland security enterprise" and the birth of "fusion centers" under the homeland security construct.

This story would not be complete without some conversation concerning the national network of fusion centers—a consortium of offices, agencies and units collecting, gathering, and sharing intelligence, and the creation of the National Fusion Center Association (NFCA), a formalized organization from which to coordinate fusion center efforts. Finally, and most importantly, the narrative will conclude by highlighting fusion center critical operational capabilities with an emphasis on intelligence analysis, the use of databases during the information gathering process, and the use of federated search technologies to bridge the search across those databases. This narrative aims to provide context to concepts, challenges and strategies discussed in later chapters.

B. IMPACTS OF 9/11

Prior to the terrorist attacks on 9/11, intelligence fusion centers were few and far between. For the most part, these "centers" were created by and organized within larger

urban law enforcement agencies to provide a crime-specific intelligence and analytic capability. Soon after 9/11, a number of law enforcement agencies began considering incorporating counter-terrorism into their mission. As the concept of "intelligence fusion" began to permeate within the state and local law enforcement environments, some major urban areas adopted the Terrorism Early Warning Group (TEWG) model for interagency coordination and information sharing.[1] Many TEWGs were designed "to identify emerging threats and provide early warning by integrating inputs and analysis from a multidisciplinary, interagency team."[2]

For example, one of the first fusion center models, formed in 1996, was the Los Angeles Terrorism Early Warning Group (LACTEW). Its mission was to deliver "all-source situational awareness and a common operating picture for the interagency response community."[3] Since then, the LACTEW has transformed into the Los Angeles Joint Regional Intelligence Center (JRIC), a recognized intelligence fusion center as of July 2006.[4] The LACTEW and other early "fusion centers" also provided criminal case support to their parent agencies by offering analytical services and products. A question remains on whether these early fusion centers considered the future evolution of information sharing; the importance of database integration; the relevance of planning, requirements gathering, selection and acquisition processes; the implications when attempting to access and search disconnected information systems.

Following the World Trade Center and Pentagon attacks, the *National Commission on the Terrorist Attacks upon the United States*, often referred to as the 9/11 Commission, identified a "failure of imagination" and information sharing between federal agencies – primarily communication, coordination and collaboration between the

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[1] Lois M. Davis, et al., Long-Term Effects of Law Enforcement's Post-9/11 Focus on Counterterrorism and Homeland Security (Santa Monica: RAND Corporation, 2010) 43.

[2] John P. Sullivan, "Terrorism Early Warning and Co-Production of Counterterrorism Intelligence," in Canadian Association for Security and Intelligence Studies (presentation, CASIS 20th Anniversary International Conference, Montreal, Quebec, Canada, October 21, 2005), 1, http://www.projectwhitehorse.com/pdfs/6.%20CASIS_Sullivan_paper1.pdf.

[3] Mike German and Jay Stanley, "Fusion Center Update," American Civil Liberties Union, July 2008, http://www.aclu.org/files/pdfs/privacy/fusion_update_20080729.pdf.

[4] Federal Bureau of Investigation, "Hand-to-Hand Cooperation: Intel Sharing without Walls," last modified August 14, 2006, http://www.fbi.gov/news/stories/2006/august/jric081406/.

Federal Bureau of Investigation and the Central Intelligence Agency.[5] The barriers to information sharing were varied and complex: Cultural, organizational and legal "walls" that became bureaucratic obstacles for information sharing. In addition, the 9/11 Commission concluded, "The biggest impediment to all-source analysis—to a greater likelihood of connecting the dots—is the human or systemic resistance to sharing information."[6]

The identification of this systemic failure later laid the groundwork for the creation of an entirely new and much broader platform from which homeland security partners could share information with one another; thus, the Information Sharing Environment (ISE) was established through a Presidential Executive Order.[7] Here, "silos" of information that were commonly referred to when discussing the intelligence failures of 9/11 were addressed. The ISE would swiftly bring together many agencies at the federal, state and local levels. While information sharing between personnel of different agencies was paramount, so too was the sharing of information or "intelligence" house in Secret-level databases at various federal agencies.

C. EVOLUTION OF INFORMATION SHARING

In the post-9/11 world, information sharing has become critical for policy makers, homeland security practitioners and other public safety partners within the homeland security enterprise. Fusion centers represent focal points for information sharing at the state and local level.[8] In the current environment, information sharing extends well beyond traditional communications between two people. In a CRS Report on the Department of Homeland Security Intelligence Enterprise, it is stated that, "(The) success of the fusion center program is dependent on the infrastructure that enables state and local fusion centers to have access to each other's information as well as appropriate federal

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[5] National Commission on Terrorist Attacks Upon the United States, *The 9/11 Commission Report* (Washington, DC: GPO, 2004) 336.

[6] Ibid., 416.

[7] Information Sharing Environment, "Background and Authorities," (n.d.), http://www.ise.gov/background-and-authorities.

[8] U.S. Department of Homeland Security, "State and Major Urban Area Fusion Centers," (n.d.), http://www.dhs.gov/state-and-major-urban-area-fusion-centers.

databases."[9] That information takes on many forms and can be found in a variety of locations. Databases are commonly used by fusion centers to develop leads, provide situational awareness and create "information composites" of people, places, things, or events.

Intelligence fusion centers play an important role in the nation's homeland security efforts. They embody a multi-faceted network of people, tools and systems designed to gather, receive, analyze, and disseminate critical homeland security information. Fusion centers have increased the depth of the nation's information sharing environment by communicating, coordinating and collaborating between various levels of federal, state and local government and with public and private sectors.

All fifty states have designated fusion centers and a number of major urban areas have fusion centers, too. In all, there are 77 DHS-sponsored and state designated or recognized fusion centers in the United States. They are as unique in name, location, design, composition, and mission as the employees who staff them. However, there are a number of common traits that fusion centers develop to provide consistency in the services they provide.

Today, fusion centers, owned and operated by State and Local governments, with support from federal interagency partners, represent a vital hub in information sharing. Unfortunately, the evolution of fusion centers has not been without some obstacles. Assessing the evolution of information sharing and intelligence analysis processes within fusion centers does not provide insight into whether the technology used in them evolved in parallel. Open issues that exist include:

- This research has characterized fusion center databases as "information silos"—tubes of information accessed, searched, and leveraged to enhance the analytical process. In many cases, these databases are disconnected and thereby difficult to search effectively. As mentioned, the manual process of searching these databases presents opportunities for human error in the context of time and selection biases.

[9] U.S. Library of Congress, Congressional Research Service, *The Department of Homeland Security Intelligence Enterprise: Operational Overview and Oversight Challenges for Congress*, by Mark A. Randol, CRS Report R40602 (Washington, DC: Office of Congressional Information and Publishing, March 19, 2010).

- It has also been argued that the volume of data available to fusion centers is increasing exponentially. Much of that information is housed in databases. Fusion centers are encouraged to explore all available information sources to enhance the intelligence analysis process. It follows then that fusion centers will find opportunities to connect to new data sources. Will those data sources be integrated into the fusion center's network environment, or will the databases be standalone?

D. STANDARD PRACTICES

Critical operational capabilities (COCs) implemented by DHS outline four mission-essential functions for standard operations: Gather, receive, analyze, and disseminate information. Fusion centers around the country have been evaluated and graded on their COC's in an effort to standardize those components of the business process.[10] This standardization provides continuity among federal, state and local partners as fusion centers carry out those critical daily functions. This research examines how the integration of federated search tools in fusion centers could enhance the analytical process and thereby expedite information sharing. Tying a federated search tool technology to a fusion center critical operational capability represents an important link as fusion centers consider planning, requirements gathering, selection, and acquisition processes. The connection between technology and a COC could also provide a foundation for future discussions—an area of policy that will be discussed in Chapter VII—Recommendations and Conclusions.

E. INTELLIGENCE ANALYSIS

As mentioned above, "analysis" is a fusion center critical operational capability. To begin to understand intelligence analysis, it is important to conceptualize the phrase individually and as a whole. Intelligence has many definitions. For the purpose of this discussion, this research project will use a recent CRS report which defines intelligence: "Information to which value has been added through analysis and is collected in response

[10] U.S. Department of Homeland Security, "2010 Baseline Capabilities Assessment of Fusion Centers and Critical Operational Capabilities Gap Mitigation Strategy," (n.d.), http://www.dhs.gov/2010-baseline-capabilities-assessment-fusion-centers-and-critical-operational-capabilities-gap.

to the needs of policymakers."[11] As for analysis, a commonly used definition is "a separation of a whole into its component parts."[12] An activity which combines those terms can be generally reflected as the deconstruction of data into individual elements in an effort to identify relationships within or between the data that, when reconstructed, might reveal something new or valuable to someone else. In the book, *Intelligence: From Secrets to Policy*, a "mosaic" metaphor is used to describe analysis.[13] Specifically, in the description, intelligence analysis resembles creating a mosaic in that the "desired final picture may not be clear" and the pieces used to create the image may be incomplete.[14] A mosaic metaphor will also be used later in Chapter VI to help frame a number of themes developed from the research analysis.

Conducting the data synthesis activity in a fusion center environment requires bringing together multiple types of data and processing it in a variety of ways. In his chapter, "The Digital Dimension," Gosler defines a number of challenges with "big data."[15] He describes the "myriad" of databases held by individual agencies and the attributes of the information contained within—"incomplete, inaccurate and even contradictory" data that often has little to no relevance.[16] For example, the analysis of telephone records, geo-spatial information, financial documents, audio clips, video files, and text messages could involve a number of data sources. Fusion center analysts utilize databases to access the types of information illustrated above to enhance their analysis. The number of databases available can be indicative of the time it will take to access, search, compile, collate, analyze, and evaluate the information queried. Until those steps are performed, the analysis could be considered incomplete. Automation of that process

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[11] U.S. Library of Congress, Congressional Research Service, *A Summary of Fusion Centers: Core Issues and Options for Congress*, by Todd Masse and John Rollins, CRS Report RL34177 (Washington, DC: Office of Congressional Information and Publishing, September 19, 2007)..

[12] Merriam Webster OnLine, s.v. "analysis," accessed July 14, 2012, http://www.merriam-webster.com/dictionary/analysis.

[13] Mark Lowenthal, *Intelligence: From Secrets to Policy*, 4th ed. (Washington DC: CQ Press, 2009), 139.

[14] Ibid.

[15] James R. Gosler, "Chapter 6: The Digital Dimension," in *Transforming U.S. Intelligence*, ed. Jennifer E. Sims and Burton Gerber (Washington DC: Georgetown University Press, 2005), 107.

[16] Ibid.

through a federated search tool offers fusion centers one opportunity to perform searches with speed, accuracy and completeness.

F. BUSINESS CASE TO INFORM ENHANCEMENTS TO ANALYSIS: WISCONSIN STATEWIDE INFORMATION CENTER

It is a commonly held notion that fusion centers across the national network have access to a variety of federal, state and local law enforcement databases. As a participant observer and former Director of the Wisconsin Statewide Information Center (WSIC), this researcher has obtained knowledge, training and experience while working in the WSIC. Exposure to information sharing and intelligence analysis in the fusion center has broadened this researcher's understanding of challenges posed by disparate databases and further highlights the importance of planning, requirements gathering, selection, and acquisition processes related to the integration of federated search tools in fusion centers. The business case to follow reveals real-world characteristics of the information sharing and intelligence analysis components at the WSIC and thereby serves to inform fusion centers about challenges related to disparate databases.

The WSIC uses the Wisconsin Department of Justice network as a gateway to the Department's case management system and the Wisconsin Law Enforcement Network, the agency's law enforcement web portal. This portal also serves as a sub-gateway to the WSIC secure site and is home to the Wisconsin Intelligence Network and WSIC's suspicious activity reporting (SAR) portal. In addition, this portal also hosts the Wisconsin Department of Corrections Inmate Locator system, a valuable tool for all users.

Beyond the core architecture listed above, WSIC utilizes 24 primary databases to support criminal and terrorism investigations. The list will continue to grow as the WSIC matures and as additional interagency partners are identified. At the moment, each database requires a unique username and password login combination. Some of the databases reside on the WIDOJ network, while others do not. Most of the databases are unclassified, while some are accessed through the HSDN Secret-level portal.

The WSIC intelligence analysts also have access to a number of other databases to develop leads, provide situational awareness and enhance intelligence analysis. A number of these critical databases are hosted and maintained by other agencies outside the WIDOJ network. Some of these databases require a paid subscription. In yet other cases, the databases require token-based hardware and multi-factor user authentication systems. Without exception, these databases also require a separate connection and a unique username and password. The process to query, locate, identify, analyze, mark, and return data can be time consuming and labor intensive given the number of databases involved.

The WIDOJ network also provides a pathway to a Wisconsin State Patrol database and a Wisconsin Department of Natural Resources database. Both provide secure access for vetted partners to query field contacts and intelligence. In addition to these agency-specific databases, the WSIC also utilizes ACCURINT, a web-based, subscription service. ACCURINT searches open source information and is able to collect and collate information related to persons, residences, neighbors, and vehicles.

The WSIC's database enterprise lacks a single sign-on, automated search mechanism commonly called a "federated search." A federated search tool could significantly reduce the length of time it would take an intelligence analyst to search all of the databases and in turn, could increase the speed with which situational awareness is provided to decision makers.

Regrettably, there is no single access point to query all of the aforementioned valuable databases. Thus, many fusion centers have encountered the ever increasing problem of how they acquire, manage, access, search, and analyze data from disparate data sources. In addition to expanding the network of content-rich data sources to include additional federal, state and local databases, some fusion centers openly explore opportunities to add other public, private and open sources of information. To effectively access those volumes of information, the WSIC and presumably all fusion centers require a federated search tool.

III. LITERATURE REVIEW

Enterprises at all levels of government and the private sector are creating, collecting and storing more data than ever before.[17] This seems to be a global trend. Cisco estimates that by 2015, 966 exabytes of information will be consumed by the Internet.[18] An exabyte (10^{18}) of data is equivalent to 1,000,000,000,000,000,000 bytes[19] or 250 million DVDs.[20] In a report written by Greiper and Sauter, the authors introduce "volume, velocity and variety," or "3Vs" to describe challenges faced by homeland security practitioners when dealing with "information overload."[21] Their assessment resonates and provides context to a number of issues at hand—the sheer volume of data, where the data is located, the presence of disconnected databases, the methods used to search those databases and solutions making the data management process more manageable.

The literature review will revolve around several themes – areas of research that tend to explain what is known, unknown and ought to be known about federated search tools; how fusion centers can integrate federated search tools to enhance the analytical process; planning, requirements gathering, selection and acquisition processes; challenges associated with those processes and how fusion centers developed strategies to overcome those challenges.

The library and some academic environments seem to have embraced federated search technologies. "Automated information retrieval systems" were initially developed

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[17] Scott Greiper and Mark Sauter, *The Business of Connecting Dots: The $1 Billion Intelligence and Security Informatics/Analytics Market*, CEUT-CIC Security Insights Report (Annapolis: Chesapeake Innovation Center, November 17, 2005), 4, http://www.cic-tech.org/docs/2005/2005-11-16-connectDots.pdf.

[18] Graeme McMillan, "Techland: News and Reviews about Gadgets, Gear, Apps and the Web," Time.com, June 1, 2011, http://techland.time.com/2011/06/01/how-big-is-the-internet-spoiler-not-as-big-as-itll-be-in-2015/, under "How Big is the Internt? (Spoiler: Not as Big as it'll be in 2015)."

[19] Wikipedia Encyclopedia, s.v. "Exabyte," accessed July 16, 2012, http://en.wikipedia.org/wiki/Exabyte.

[20] Cora Lauderdale, "How Much is an Exabyte," eHow.com, July 29, 2012, http://www.ehow.com/about_5712369_much-exabyte_.html.

[21] Greiper and Sauter, *The Business of Connecting Dots*, 5.

for libraries as a means to manage data.[22] Federated searches allow users to search across a number of sources: subscription-based, library catalogs and web sites. Federated search tools such as Google Scholar, WorldCat, EBSCO, CSA, and ProQuest, to name a few, seem to be well adopted within the domains of higher education. What is clear is that libraries and universities have acquired and integrated federated search technologies to enhance the research experience and to reduce the amount of time spent scouring "news archives, e-journal aggregators, indexing services, proprietary databases, and subscription services."[23]

While there is seemingly widespread agreement that federated search tools can augment the research process, there are some shortcomings. Luther and Kelly indicate in their article, "The Next Generation of Discovery" that federated search engines have not fully developed and have fallen considerably short of expectations. They cite "structural complexity" and sluggishness within the search process as reasons to consider other technology.[24] It is unclear if the structural complexity they refer to is the federated search tool itself, the process of conducting the search using the tool or the underlying technical architecture. Luther and Kelly recommend that librarians and others consider "content, search, fit, and cost" during the selection and integration process of new technology…"[25] Their recommendations seemed to resonate well beyond their community of interest and serve to springboard this analysis to another area of the literature.

Business planners, engineers, consultants, and others within the private sector have taken a critical look at the process leading to the acquisition of a federated search technology. While this roadmap only serves as a starting point, it identified a number of

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[22] Zdenka Linkova, "European Summer School in Information Retrieval ESSIR 2005," Institute of Computer Science: Academy of Schiences of the Czech Republic (February 2006): 2, http://www3.cs.cas.cz/ics/reports/v949-06.pdf.

[23] Stanford University, "Stanford University Libraries Launches Federated Search," March 27, 2008, http://www-sul.stanford.edu/about_sulair/news_and_events/federated_search.html.

[24] Judy Luther and Maureen C. Kelly, "The Next Generation of Discovery," Library Journal, March 15, 2011, http://www.libraryjournal.com/lj/articlereview/889893-457/the_next_generation_of_discovery.html.csp.

[25] Ibid.

key considerations: identifying a business reason, articulating the benefits, defining requirements using a collaborative approach, developing evaluation criteria, vetting the prospective technology vendors, exercising a demanding evaluation of the technologies, and ultimately implementing a solution are key attributes within this pathway.[26] There may be other characteristics to a planning process, but those mentioned above reinforce elements of the hypothesis of this research project.

For fusion centers and particularly the Wisconsin Statewide Information Center, stating the business case is likely the first step in the integration process. Some questions to ponder come from the same literature set: Why does the fusion center want (or need) a federated search tool; Who are the participants in the process and how do they stand to benefit What is the problem the federated search tool will solve; Will the federated search tool have any agency strategic importance; Will the fusion center (or its parent agency) commit to the investment or has a funding source been identified; Does the concept of a federated search tool have concurrence among decision makers?[27] While these questions seem fundamental to the business process, it is unclear if fusion centers have taken this approach to prepare for the acquisition of a federated search tool. The literature disagrees on the value of these processes – government documents, covered later within this review, provide little guidance and do not clearly reinforce the importance of the processes leading a fusion center to the acquisition of a federated search tool.

In addition to stating a business case, another subsection of the literature speaks to identifying benefits of the federated search tool and assessing the projected return on investment. For fusion centers, the cost of the tool compared to its value is a conversation likely to be encountered during the planning process. Benefits of a federated search tool in a fusion center could include how it automates the database inquiry process, reduces the margin for human error, and reduces the time it takes to search the databases - all enhancing the analytical process. Other benefits might include

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[26] Sol, "Federated Search: Roadmap to a Solution," Federated Search Blog, May 23, 2008, http://federatedsearchblog.com/2008/05/23/federated-search-roadmap-to-a-solution/.

[27] Sol, "Federated Search Roadmap: Part 1 – Stating the Business Case," Federated Search Blog, May 30, 2008, http://federatedsearchblog.com/2008/05/30/federated-search-roadmap-part-i-stating-the-business-case/.

cost savings, improving the quality of the analytical research, increasing analytical competitiveness, or creating an enriched user experience.[28] While the literature is generally in agreement that federated search tools enhance the research process, guidance from the federal government to fusion centers does not clearly define what fusion centers should do, and more importantly, how they should do it.

So far, the literature review has identified some prevailing technologies, some of the shortcomings, a roadmap to implementing a federated search tool, defining the business case, and examining the benefits of the solution. One last concept worth mentioning is the evaluation component of the planning process. For fusion centers, the evaluation process has not been sufficiently considered. Concepts of reliability, technical support, security, interface flexibility, and platform readiness come to mind.[29] This list is not all-inclusive. Connecting a number of disparate databases in a fusion center's network environment might be complex. A federated search tool should serve as a reliable, seamless and transparent technology to the end user. The literature relating to federal guidance to fusion centers is generally mute on these characteristics and thereby leaves fusion centers in a vulnerable position as they attempt to implement complex and expensive technologies.

Once the federated search tool is implemented, the measurement of effectiveness will be a topic of interest. While measuring the efficacy of a federated search tool was beyond the scope of this research project, it was assumed that such technology would generally enhance the analytical process. There is some debate within the literature about how to measure effectiveness. What the literature seems to agree on is that a number of variables influence how a federated search technology acts in a particular environment. What seems constant is the notion that the effectiveness of a federated search tool is dependent upon three common characteristics; "resource description, resource selection,

28 Sol, "Federated Search Roadmap: Part II – Identifying Benefits," Federated Search Blog, June 30, 2008, http://federatedsearchblog.com/2008/06/30/federated-search-roadmap-part-ii-identifying-benefits/.

29 James A. Martin, "How to Evaluate Enterprise Search Options," International Data Group: ComputerWorld, February 8, 2012, http://news.idg.no/cw/art.cfm?id=B4B5663F-E17E-D476-AA3A846A44184C6F.

and results merging."[30] Said another way, these characteristics, including the contents of the resources, the contents selected for inquiry and how the results reach the end user from the query, are fundamental processes that help define how effective the tool is. It is unknown if fusion centers contemplate such characteristics in assessing the efficacy of the tool and whether those impressions would be represented in any evaluation process. This information could add significant value to the overall analysis of a federated search tool.

As alluded to earlier, a number of principal U.S. Government policy frameworks and documents detail the evolution of homeland security, the information sharing environment and the national network of fusion centers. These documents represent the critical "blueprints" used by state and major urban area fusion centers. The content found in these documents, which is largely organizational, policy-minded, and in some cases technical, dates back to 2004 when the Intelligence Report and Terrorism Prevention Act (IRTPA) was signed. An analysis and evaluation of that literature revealed that the federal guidance, however voluminous, seemingly lacked substantive instruction to fusion centers on how they should plan, gather requirements, select, acquire, and integrate federated search tools to bridge disparate databases containing homeland security information. For example, the Fusion Center Guidelines published by the USDOJ's Global Justice Information Sharing Initiative suggest that fusion centers should, "Leverage existing databases, systems, and networks to maximize information sharing."[31] Unfortunately, those guidelines do not specify how.

This analysis also suggests that a technical void exists—a hole in the architecture of fusion centers. Given that information sharing is a cornerstone of the fusion center initiative and information commonly resides in databases, it would seem to follow that attention would have been directed to that aspect of the fusion center business

30 Luo Si and Jamie Callan, "Modeling Search Engine Effectiveness for Federated Search" (Paper, Carnegie Mellon University, n.d.), 1, http://www.cs.cmu.edu/~callan/Papers/sigir05-lsi.pdf.

31 U.S. Department of Justice's Global Justice Information Sharing Initiative, Fusion Center Guidelines: Developing and Sharing Information and Intelligence in a New Era – Guidelines for Establishing and Operating Fusion Centers at the Local, State, and Federal Levels, (Washington, DC: OJP, August 2006), 33, http://www.it.ojp.gov/documents/fusion_center_guidelines_law_enforcement.pdf.

development model. Furthermore, a number of Government Accountability Office (GAO), Congressional Research Service (CRS), RAND, ISE, and DHS Office of the Inspector General (OIG) reports agree and speak loudly to the lack of guidance provided to fusion centers in the area of technology integration and information management. For example, the GAO reported in October 2007 that "multiple information systems" in fusion centers created "redundancies of information" and that "end users were overwhelmed with duplicative information from multiple sources."[32] In a follow-up report to that 2007 study, personnel in 20 of 58 fusion centers indicated the available federal guidance "lacking in specificity, conflicting, confusing or difficult to implement."[33] One fusion center said the *Fusion Center Guidelines* were broad and did not provide guidance on how to "connect the multiple information-sharing systems."[34] In a CRS report from 2011, information technology (IT) and how it connects with the national information sharing architecture remains a challenge for fusion centers. While the Nationwide SAR Initiative relies on this architecture for suspicious activity reporting, the guidance is vague on how fusion centers can connect and search against other sources of data within their networks.[35] In yet another example, it is argued there exists a considerable misconception that state and major urban area fusion centers are utilizing sophisticated systems—tools that "have access to all databases available within their jurisdiction."[36] In a final example, coming from an internal audit at DHS, it was reported that fusion center personnel indicated, "There were too many federal systems" and, "No

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[32] United States Government Accountability Office, Interagency Collaboration: Key Issues for Congressional Oversight of National Security Strategies, Organizations, Workforce, and Information Sharing, (Washington, DC: GAO, September 2009), 50, http://www.gao.gov/assets/210/203867.pdf.

[33] United States Government Accountability Office, Homeland Security: Federal Efforts are Helping to Alleviate Some Challenges Encountered by State and Local Information Fusion Centers, (Washington, DC: GAO, October 2007), 37, http://www.gao.gov/new.items/d0835.pdf.

[34] Ibid.

[35] U.S. Library of Congress, Congressional Research Service, *Terrorism Information Sharing and the Nationwide Suspicious Activity Report Initiative: Background and Issues for Congress*, by Jerome P. Bjelopera, CRS Report R40901 (Washington, DC: Office of Congressional Information and Publishing, December 28, 2011).

[36] U.S. Library of Congress, Congressional Research Service, *Fusion Centers: Issues and Options for Congress*, by John Rollins, CRS Report RL34070 (Washington, DC: Office of Congressional Information and Publishing, January 18, 2008).

ability to conduct comprehensive or simultaneous searches across multiple systems or DHS databases."[37]

In summary, the literature is very telling: It describes challenges with federated search tools; the value of business needs, planning and evaluation; implementation considerations; the overwhelming consensus on lack of federal guidance to fusion centers on the integration of federated search tools and other information management technologies. Unfortunately, fusion centers are not able to tell their story directly. Given the nature and sensitivities of their mission and use of technology, it is no surprise then that fusion centers would hold those details close and outside of public scrutiny.

Again, there is agreement that federated search tools can serve as force multipliers when it comes to locating, analyzing, and collating large volumes of data. The literature further agrees that a federated search tool can take many forms. In some cases, the literature is contemporary; in others, outdated. As technology advances, new research will be required to keep pace with next generation federated search tools. Until such technologies are designed, developed, implemented, tested, and evaluated, the research should continue to provide depth to the planning, requirements gathering, selection, and acquisition processes that prove central to the integration process. Fusion centers should benefit from that research.

Only after the primary literature review, a secondary review focusing on specific policies and technologies and a tertiary review focusing on fusion centers that had acquired such technologies did it become clear how "concealed" data was within the fusion center network. While this information has been extracted from the literature, it took a methodical and layered approach from several angles to determine what was known, unknown and ought to be known about federated search tools. Even in this data, discrepancies, disparities and disagreement elevate some key issues surrounding federated search tool integration, challenges and strategies. The survey instrument

[37] United States Department of Homeland Security, Information Sharing with Fusion Centers has Improved, but Information System Challenges Remain, (Washington, DC: OIG, October 2010), 15, http://www.oig.dhs.gov/assets%5CMgmt%5COIG_11-04_Oct10.pdf.

designed to bridge the knowledge gaps discussed in the following chapter offers a connection to the problem space and research questions. A closing thought:

> Technology can assist, but the fundamental hurdles to information sharing are not technical. Indeed, commercial off-the-shelf technology can provide solutions to technical issues. It is a combination of people, processes, policies and cultures that leverages advances in information technology.…[38]

The above observations encompassed within a Markle Report on Information Sharing shares a concern identified in the problem space of this research project – that processes, when combined with the interests of employees and the organizational structure of an agency, can advance the integration of technology and enhance information sharing.

[38] The Markle Foundation: Task Force on National Security in the Information Age, Nation at Risk: Policy Makers Need Better Information to Protect the Country, (New York: March 2009), 20, http://www.markle.org/sites/default/files/20090304_mtf_report.pdf.

IV. METHODOLOGY

A. INTRODUCTION

This research, informed by the author's professional observations and interactions with fusion center directors, intelligence officers, intelligence analysts, information technology (IT) support personnel, and others within the national network of fusion centers, has identified opportunities for improvement current in information management and intelligence analysis processes. Planning, requirements gathering, selection, and acquisition processes provide a pathway for integration of federated search tools in fusion centers. These opportunities focus on developing an interface and/or set of mechanisms that enhances connectivity and access to data sources. More specifically, they focus on enhancing access to disparate databases with a federated search capability – that is, those with an automated tool or process can search a number of databases looking for information relevant to a particular person, place, thing or event. While an opportunity for improving access to disparate databases exists in the Wisconsin Statewide Information Center, such enhancements could benefit other fusion centers.

B. METHODOLOGY

The present research used multiple methods of inquiry. While it is primarily rooted in the "smart practice" exploration tradition, it draws upon survey research using an Appreciative Inquiry (AI) lens as a perspective to inform "smart practices." A brief explanation of smart practices, survey design, and appreciative inquiry will be offered as background to illustrate the significance of these methods in this research project.

1. Smart Practices

The phrase "best practice" is commonly used when describing an organizational policy or process that works well. As the name implies, that practice may be used to the exclusion of all others. Not all "best practices" can be applied to the same problem in the same manner in the same organization. Smart practices, on the other hand, take on a slightly different meaning. For the purposes of this research project, smart practices are

generally referred to as "solutions that have worked well;" they are identified while attempting to understand why and how the solution worked and whether it can be applied to a similar problem somewhere else.[39] In the context of federated search tools in fusion centers, this project investigates what planning, requirements gathering, selection, and acquisition processes are currently being practiced as part of the integration process; what challenges have been encountered; whether the process practices have helped mitigate those challenges; whether the practices have enhanced the analytical process. This smart practice exploration among fusion centers anticipated finding such processes - successful ideas, expressions, stories, lessons, or procedures practiced in the fusion centers - with a goal of sharing those practices with other fusion centers.

2. Survey Design

This research also used a semi-structured survey instrument. Survey design can offer a quantitative or qualitative description of patterns, relationships, or impressions of a population by studying a sample of the population.[40] From the survey results, a researcher can often make generalizations about the population. In this case, the survey was developed to sample the national network of fusion centers to better understand how fusion centers integrate federated search tools; what planning, requirements gathering, selection, and acquisition processes exist; what challenges were faced during integration; how fusion centers developed strategies to overcome those challenges. The survey questions were designed with those key process questions in mind, crafted in an open style, anticipating content-rich narrative responses suitable for qualitative analysis. The survey quickly became the best choice for data collection as the data needed for the research did not readily exist in the literature, or it was illustrated through the eyes of a commercial vendor in the form of a marketing "white paper."

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[39] Eugene Bardach, *A Practical Guide for Policy Analysis*, 3rd ed. (Washington, DC: CQ Press, 2009), 95.

[40] John W. Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*, 3rd ed, (Los Angeles: Sage Publications, Inc., 2009), 145.

3. Appreciative Inquiry

Barrett and Fry, in their book *Appreciative Inquiry: A Positive Approach to Building Cooperative Capacity,* describe AI as an approach to "organizational capacity building."[41] Said another way, AI assumes that systems, networks, or organizations have strengths. By looking at positive experiences, lessons learned, successful efforts, proven methods, insightful impressions, and smart practices, AI provides the canvas from which to paint the picture—a mosaic of concepts to build capacity and transform a system.[42] The AI approach to inquiry is "strength based," "artful," collaborative," inclusive," and "generative." Together, these attributes help define the potential or capacity of a system.[43]

In their book *Appreciate Inquiry: A Positive Revolution in Change*, Cooperrider and Whitney define AI as the, "Cooperative, coevolutionary search for the best in people, their organizations and the world around them."[44] They go on to say that AI involves, "Systematic discovery of what gives life to an organization…when it is most effective and most capable…"[45] The "positive core" their research revealed had a number of attributes, including "technical assets, best business practices, product strengths, and breakthrough innovations," to name a few.[46] The AI method used in this research was utilized for these very reasons: Identify and exploit, for the benefit of others, the assets, practices, strengths, and innovations found across the national network of fusion centers in the domain of federated search tool integration.

The Wisconsin Statewide Information Center (WSIC) was selected as the initial sample for smart practice exploration, given the level of access it afforded this researcher. Based on professional interactions with other fusion center leaders, this researcher

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[41] Frank J. Barrett and Ronald E. Fry, *Appreciate Inquiry: A Positive Approach to Building Cooperative Capacity*, (Chagrin Falls: Taos Institute Publications, 2005), 23.

[42] Ibid., 25.

[43] Ibid., 27.

[44] David L. Cooperrider and Diana Whitney, *Appreciative Inquiry: A Positive Revolution in Change*, (San Francisco: Berrett-Koehler Publishers, Inc., 2005), 8.

[45] Ibid.

[46] Ibid., 9.

believed the WSIC was of similar size, composition and mission to a number of fusion centers across the network. Those likenesses were evaluated and applied to the research method.

In summary, this method of inquiry proved beneficial in that it offered flexibility during the collection phase and provided an approach to evaluate smart practices. Using AI provided a perspective to better understand how federated search tools are being integrated and benefit fusion centers to bridge disparate databases to enhance the analytical process. The inquiry also examined what planning, requirements gathering, selection, and acquisition processes took place; whether any challenges were encountered during integration; what strategies were developed to overcome those challenges.

4. Sample

Two populations were sampled during this research. The first population involved personnel, policies and processes at the Wisconsin Statewide Information Center (WSIC). The researcher was a participant observer and had first-hand knowledge of opportunities to enhance the analytical process using a federated search tool. Beyond these professional interactions and observations, research included an analysis of trade journal articles, technical literature, corporate white papers, and other documents, comprising a variety of sources to inform smart practices at the WSIC. The problem and opportunities for process improvements were witnessed at the WSIC and very well may be generalized to other fusion centers.

The second sample for this smart practice exploratory research will be drawn from subject matter experts and colleagues from the national network of fusion centers. Specifically, all 77 designated and recognized state and major urban area fusion centers were asked to participate. Of the 31 responses to the survey, 20 fusion centers were represented, or nearly 26% of the national network. These fusion centers and their staff represent a collective understanding regarding the integration of federated search tools in fusion centers across the U.S. and have institutional knowledge from which to draw information concerning planning, requirements gathering, selection, and acquisition processes.

5. Data Collection

The data collection process involved direct and indirect contact with fusion center directors, intelligence officers, intelligence analysts, IT support staff, and other subject matter experts. This research leveraged a web-based electronic survey instrument as a primary means of collection and when needed, used electronic mail, telephone contact, product literature, technical specifications, and other information to provide clarification or add context to the analysis.

a. Survey Instrument Design

Careful consideration was given to the survey used in this research. The goal was to create a survey that could be sent to a cross-section of fusion center personnel in an effort to identify unique qualities, characteristics and challenges associated with the technology through the lens of the fusion center user group. Fusion center directors, intelligence officers, intelligence analysis, IT support staff, and others within the information sharing environment will likely apply, analyze and evaluate information relative to the technology differently, and those variances were what the survey tool was purposefully designed to capture. Said another way, the research data, analysis, and findings are most valuable when recounted through the eyes and experiences of the subject matter experts. These individual perspectives enrich the analysis and provide an incredibly illuminating synthesis of insight.

Overall, the survey contained a total of 15 questions. The first five questions captured fusion center demographics and contact information for the individual completing the survey. There were both mandatory and optional questions in this area of the survey instrument. The remaining ten questions captured information relative to the federated search tool technology, integration processes, challenges encountered during integration, and strategies developed to overcome those challenges. Those questions were developed to illicit open, narrative responses. Again, offering fusion center personnel the opportunity to tell their story about a given technology was deemed essential to understanding not only the characteristics of the technology, but also the

details surrounding the planning, requirements gathering, selection, and acquisition processes, the identification of any challenges, and strategies developed to overcome those challenges.

This researcher developed the survey instrument with the input from several subject matter experts and the instrument was tested on two separate occasions with two separate pilot groups in an effort to gauge the content, format, word choice, and appearance of the survey instrument. Through this process, a consensus was reached that the survey instrument was suitable for delivery.

b. Main Survey

With input from the subject matter experts and the pilot surveys complete, the main survey was administered to the target population. A unique hyperlink to the Internet-based survey instrument was embedded in an e-mail and delivered electronically from this researcher to the national network of fusion centers through the National Fusion Center Association (NFCA) "list serve," a mechanism by which an electronic e-mail could be delivered to the NFCA's entire membership through a single e-mail address. The e-mail was directed to all applicable fusion center staff to include directors, intelligence officers, intelligence analysts, IT support staff, and others.

The contents of the e-mail were limited, but offered a brief introduction, a short background, the unique hyperlink, and instructions. At the end of the survey, the fusion center employee being surveyed was directed to click a "submit" button to automatically and electronically collect and save the data contained within the survey instrument. The surveyed participants were provided with a two week period to receive, complete and return the survey: The surveys were delivered electronically to the research sample on 29 May 2012; the survey period closed on 12 June 2012. Review of the collected data began on 15 June 2012. The data collected was stored on the SurveyMonkey™ Internet site, within an account containing a unique username and password prohibiting unauthorized access. Collected data remained in its native electronic format and was not altered. The data was kept secure until it was analyzed.

6. Data Analysis

Using “smart practice” exploratory research framework and using a constant comparative method, the analysis identifies comments and patterns related to planning, requirements gathering, selection, and acquisition processes surrounding integration of federated search tools in fusion centers. The patterns identified several themes: Concepts concerning the integration of federated search tools and relationships between the planning, requirements gathering, selection, and acquisition processes. The results of this analysis are explained in Chapter V.

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V. ANALYSIS

A. INTRODUCTION

As mentioned in Chapter IV, this research has openly explored smart practices across the national network of fusion centers—practices involving the integration of federated search tools to bridge disparate databases to enhance the analytical process. That exploration involved Appreciative Inquiry and elements of qualitative analysis. The goal was to locate the stories that would add value, such as narratives from fusion center personnel seen through their perspectives, concerning technologies in use, challenges faced and strategies developed to overcome those challenges. To provide a framework for the telling of those stories, this research will add a methodology referred to as constant comparison.[47]

B. CONSTANT COMPARISON: A KALEIDOSCOPE OF DATA

As mentioned in the previous chapter, Appreciate Inquiry would be supported by other analytical frameworks and visualization tools. In their research, Dye, Schatz, Rosenberg, and Coleman utilize a "kaleidoscope" metaphor as a framework for the grouping and analysis of qualitative research data.[48] While the kaleidoscope worked for these researchers in 2000, a number of tools have been developed that would offer a comparable framework from which to launch the data analysis. Word mapping software tools like Mindomo, SimpleMind and iMindMap were developed to provide researchers and academics alternatives to visualizing data and making sense of relationships within and between data. For the purposes of this constant comparison, a mapping visualization was constructed by this research using Mindomo.

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[47] Jane F. Dye, Irene M. Schatz, Brian A. Rosenberg, and Susanne T. Coleman, "Constant Comparison Method: A Kaleidoscope of Data," The Qualitative Report 4, no. ½ (January, 2000): 1, http://www.nova.edu/ssss/QR/QR4-1/dye.html.

[48] Ibid.

C. APPLICATION OF ANALYSIS FRAMEWORK

Using the Mindomo tool, this researcher intends to develop a virtual "kaleidoscope" to visualize, analyze, and evaluate the data drawn from the survey instrument. Words, phrases, and notions were identified and categorized into themes, or spheres of rich content drawn from the knowledge, skills and experiences of personnel within fusion centers. Particular attention will be drawn to the responses concerning the processes of planning, requirements gathering, selection, and acquisition of a federated search tool.

Beyond those processes, the analysis will explore the challenges identified and any strategies to mitigate those challenges. The spheres will be analyzed for trends or associations such as relationships between federated search tools, planning, requirements gathering, selection, and acquisition processes. That analysis will reveal a vast array of practices with the goal of highlighting smart practices in fusion centers.

D. CATEGORIZING DATA

The data collected will be organized by survey question and then by identified theme within a given question, if applicable. This method will provide additional continuity, as the analysis will tie back to the research questions and the survey questions. The first six questions provide fusion center demographic and survey participant data. That data will serve as a foundation for subsequent analysis. The remaining nine questions speak directly to the planning, requirements gathering, selection, and acquisition processes of federated search tools in fusion centers.

1. Survey Question 1

What is the name of your fusion center? Of 34 responses, 27 provided the name of their fusion center. This question was optional.

2. Survey Question 2

How many employees work in your fusion center? Of 34 responses, 13 responded in the 0–24 employees; 13 responded in the 25–49 employees; eight responded in the 50 or more employees (see Figure 1). This question was required.

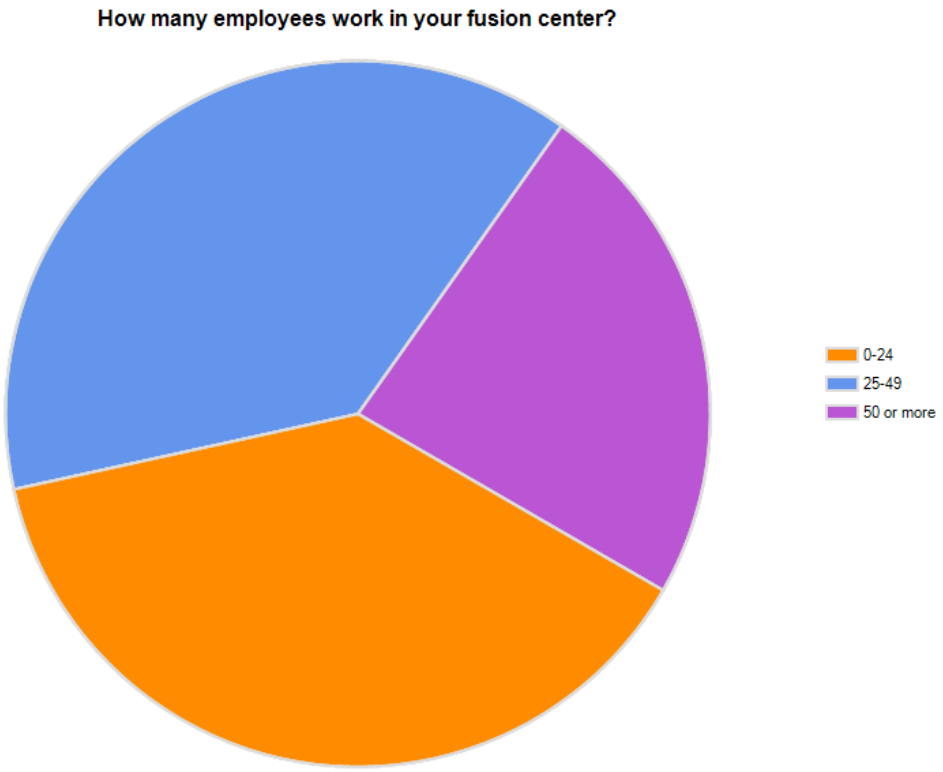

Figure 1. Fusion Center Employee Distribution (From[49])

3. Survey Question 3

The fusion center employee participating in the survey was asked if they would be willing to provide their contact information to include name, e-mail address, and telephone number. Of 34 responses, 24 provided contact information. This question was optional.

[49] Federated Search Tools in Fusion Centers, SurveyMonkey, last modified June 17, 2012, https://www.surveymonkey.com/s/FederatedSearchToolsinFCs.

4. Survey Question 4

What is the title of the individual completing the survey? Of 34 responses, 26 provided an occupational title. The titles were wide ranging, reflecting a broad spectrum of position classifications across government. This question was optional.

5. Survey Question 5

What is the position within the fusion center of the individual completing the survey? Of 34 responses, 18 were fusion center directors, one was an intelligence officer, four were intelligence analysts, three were information technology support, and eight represented other positions within their fusion centers (see Figure 2). This question was required.

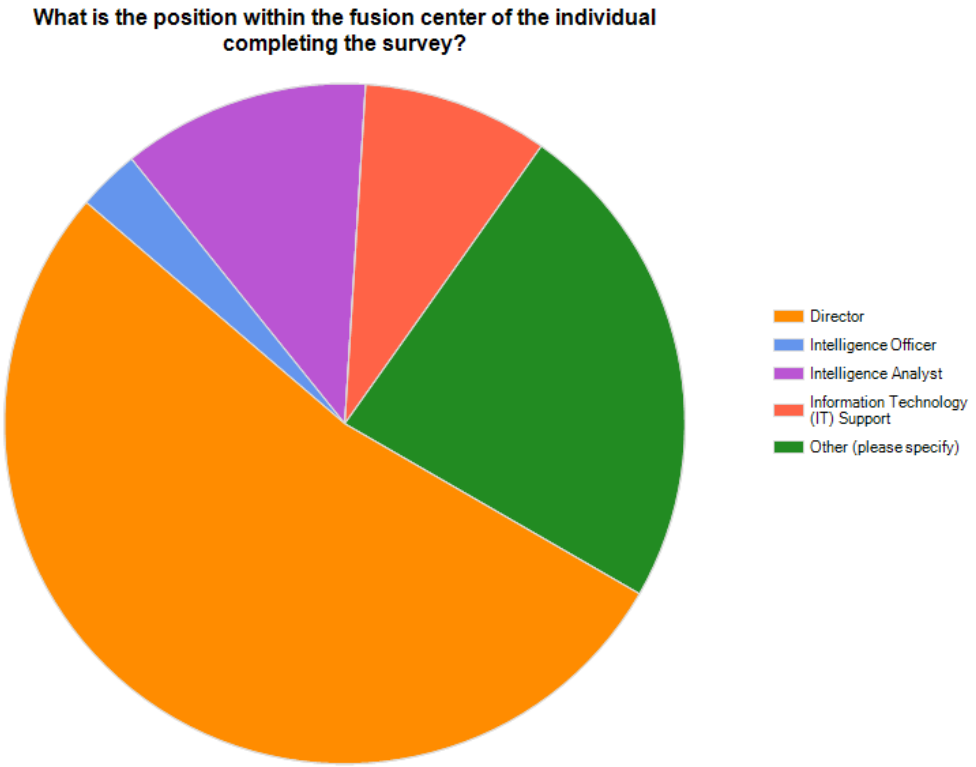

Figure 2. Classification of Fusion Center Employee Completing Survey (From[50])

[50] Ibid.

6. Survey Question 6

The following definition was given to participants: "Federated search tool—a technology that enables users to search across multiple information sources simultaneously through one search query." Participants were then asked, "Based on the above definition, does your fusion center use a tool with federated search capability that was designed to connect and permit searching across data sources?" Of 34 responses, 33 answered. Of those 33, 22 indicated their fusion center used a federated search tool, which represents 66.7% of those surveyed (see Figure 3). This question was required.

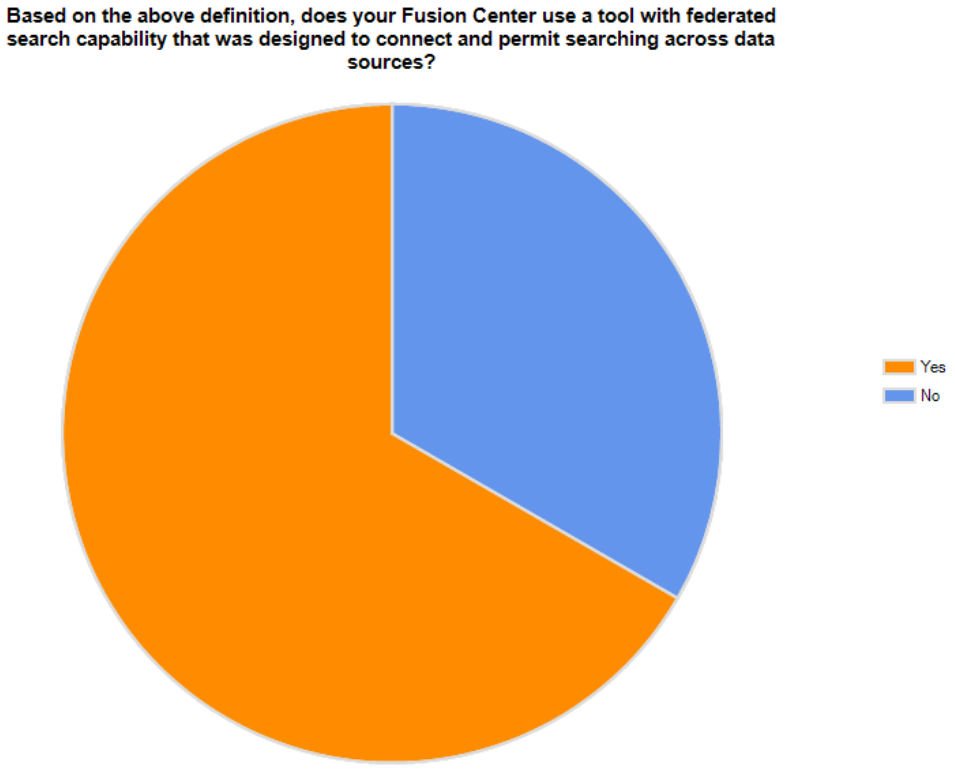

Figure 3. Distribution of Fusion Centers Using Federated Search Tools (From[51])

[51] Ibid.

7. Survey Question 7

This question was required if the survey respondent chose "yes" to Question 6: You chose yes to Question 6. Please answer the following: What prompted your Fusion Center to consider integrating a federated search tool into its operations? Of 34 respondents, 21 answered this question. An analysis of the responses revealed a couple of themes.

First, the participants indicated that "efficiency" was a driving force behind the integration of a federated search tool. Efficiency, as defined by the participants when applied to their individual work environments, was bundled with other words or phrases. For example, comments such as, "Attempting to gather as much information as possible," "Establish patterns," "Time saving," "By allowing analysts to spend much needed time handling/searching for indicators/behaviors" were equated by the participants with efficiency.

Next, the participants suggested that federated search tool integration was prompted by a desire to leverage technology already in use. For example, a number of fusion centers had already begun working with local, state, and regional partners to share information across databases. Given that a specific technology was in place to bridge disparate data sources, the fusion centers could rely on that technology to enhance their analytical processes.

Lastly, some participants identified a "growing amount of data" as a concern when considering the integration of a federated search tool. The volume of data, presented to fusion centers in "disparate data sources" was also tied to a "growing number of customers." With the increase in data also came an increase in the number of fusion center clients. These clients quickly learned that data was not always easily accessible or was located within a database that was disconnected to the fusion center.

8. Survey Question 8

This question was required if the survey respondent chose "yes" to Question 6: You chose yes to Question 6. Please answer the following: If your fusion center decided to further investigate the integration of a federated search tool into its operations, what

planning activities occurred? Of 34 respondents, 21 answered this question. Analysis of the responses revealed a wide range of themes. Those themes have been collated into a number of sub-themes:

a. Sub-theme: Policy

Survey respondents reflected that policy addressing "standards," "security" and "MOUs" should be considered during the planning phase of integrating a federated search tool in a fusion center.

b. Sub-theme: Technology

A number of survey respondents highlighted "security" and "information sources that would be mapped" as considerations when initiating planning activities to integrate a federated search tool in a fusion center. Other notable considerations included required bandwidth and data storage capacity. With the exception of identifying and "mapping" data sources, this researcher was somewhat surprised that more fusion centers did not describe federated search tool integration into the existing technical landscape as a planning consideration.

c. Sub-theme: Administrative

In several of the answers, survey respondents considered "site visits," "product demonstrations" and review of fusion center "best practices" when planning for integration of a federated search tool. This researcher would be interested in where fusion centers went or who fusion centers called to identify and evaluate "best practices." The literature review did not immediately produce any contemporary resources for fusion centers to identify what could be coined "smart practices" in use within the national network of fusion centers regarding identification, evaluation, acquisition, implementation, and use of federated search tools to enhance the analytic process.

In addition, survey respondents mentioned that "cost" and "effectiveness" were important considerations during the planning phase. A couple of fusion centers went so far as to say that the federated search tool's "return on investment" would be considered prior to selection and/or acquisition. Like "best practices" highlighted above,

this researcher would be interested in how a fusion center's "return on investment" calculation would be made and then applied to the overall planning process. It could be that some fusion centers have defined and captured metrics that illustrate specific capabilities or capacities within the business environment that tie back to the federated search tool and its investment.

Finally, in several cases where federated search tools had already been integrated into the fusion center, the survey respondents indicated that no further planning was required on their part.

9. Survey Question 9

This question was required if the survey respondent chose "yes" to Question 6: You chose yes to Question 6. Please answer the following: If your fusion center decided to further investigate the integration of a federated search tool into its operations, what business and/or technical requirements gathering processes took place and who (roles) was involved in those processes? Of 34 respondents, 20 answered this question. Analysis of the responses revealed a few themes.

Out of the 20 survey respondents, about half described the business/technical requirements gathering process in some fashion. The level of detail ranged from simple identification of a technology, all the way to the creation of a multi-layered project team to identify requirements and make recommendations. No discernible themes were identified.

One survey respondent described a robust project team, which included a project manager, a fusion center director, a state law enforcement chief information security officer, and an information technology subject matter expert. It appears the project team was empanelled following an evaluation of fusion center "best practices." Based on the commentary provided, the project team clearly conducted research. While this description appears to be the exception and not the rule, the concept of bringing together different levels of an organization with different skills sets might prove to be a "smart practice."

Beyond the requirements gathering process, the analysis revealed that there were three classifications of employees primarily involved in the process: Fusion center analysts, fusion center directors and information technology professionals. While these occupational classifications were not always working together in each of the fusion centers during the requirements gathering phase, the fusion centers that responded drew upon the expertise of those three classifications either individually or collectively during that phase of the process.

10. Survey Question 10

This question was required if the survey respondent chose "yes" to Question 6: You chose yes to Question 6. Please answer the following: If your fusion center decided to further investigate the integration of a federated search tool into its operations, what was the tool selection process? Of 34 respondents, 20 answered this question. Analysis of the responses revealed a few themes.

First, the survey respondents indicated that product "demonstrations" by prospective vendors and "user feedback" by fusion center personnel was the primary evaluative mechanisms within the tool selection process. A sub-theme inferred from the user feedback of product demonstrations was that fusion centers assessed tools based upon the tools' perceived "necessity, effectiveness and efficiency." In this case however, the survey respondents did not define the specific attributes of the tool which would make it "effective" or "efficient."

In several of the answers, the survey respondent was unaware of the selection process by which the federated search tool was selected.

In yet another instance, it appears at least one survey respondent "reviewed open-source literature," "requested feedback from company on users," "invited company(s) in to provide demonstrations," and conducted an "internal review meeting with participants of the demo/meeting." The process outlined in that response speaks to not only selection, but also the planning process question under Question 8.

11. Survey Question 11

This question was required if the survey respondent chose "yes" to Question 6: You chose yes to Question 6. Please answer the following: If your fusion center decided to further investigate the integration of a federated search tool into its operations, what product acquisition process took place? Of 34 respondents, 18 answered this question. Analysis of the responses revealed a primary theme.

The responses identified a formalized business process by which fusion centers utilized a request for quote (RFQ), request for purchase (RFP), or a purchase order (PO). In some cases, the fusion center coordinated the aforementioned processes; in other cases, an information technology unit supporting the fusion center coordinated the process. For example, in one response, the survey respondent reflected on the shortcomings of sole source justifications and the bid process. In that respondent's estimation, agencies often end up with technology they do not want or need as a result of the complexities inherent to the bid process. To be successful, the respondent suggested that managers "begin with the end in mind" when planning to procure or integrate technology. This researcher perceives that statement as fairly insightful considering it inverts the planning process: this methodology could serve planners well. As an illustration, a project manager surveys the overall process; disassembles the component parts; reviews the last part, evaluates the end result; analyzes every step, working backward, potentially revealing valuable data related to the planning, requirements gathering, selection, and acquisition processes - likely an approach not often considered by planners or project managers.

12. Survey Question 12

This question was required if the survey respondent chose "yes" to Question 6: You chose yes to Question 6. Please answer the following: If your fusion center decided to further investigate the integration of a federated search tool into its operations, please describe the challenges and what strategies were used to overcome those challenges? Of 34 respondents, 18 answered this question. Analysis of the responses revealed a number of themes.

The most prevalent theme centered on the challenge of "cost." Within cost, survey respondents defined their financial challenges in terms of initial cost, sustainment cost, cost sharing, and data sharing agreements, i.e., "pay to play." By and large, the mitigation strategy to the cost challenge involves developing partnerships with like agencies to share the financial burden imposed by the acquisition and maintenance of the technology.

Another theme highlighted by the survey respondents included "technology" challenges. The respondents described these challenges in terms of "information technology (IT)" support, federated search "access restrictions" and in one case, "dual layer authentication"—a process for security.

A single response, not necessarily representing a common theme, involved a fusion center's observation with regard to acquiring technology using a "proprietary mentality." Based on the researcher's impressions of the response, it was clear the fusion center was identifying a trend whereby agencies develop databases on their own without considering who may want access now or in the future. The mitigation strategy offered by that fusion center discussed the importance of developing partnerships with agencies for information sharing.

13. Survey Question 13

Survey respondents were directed to this question if they answered "no" to Question 6: If your fusion center has not yet integrated a federated search tool, are you considering doing so? Of 34 responses, 11 answered (see Figure 4). Of those 11, six indicated yes.

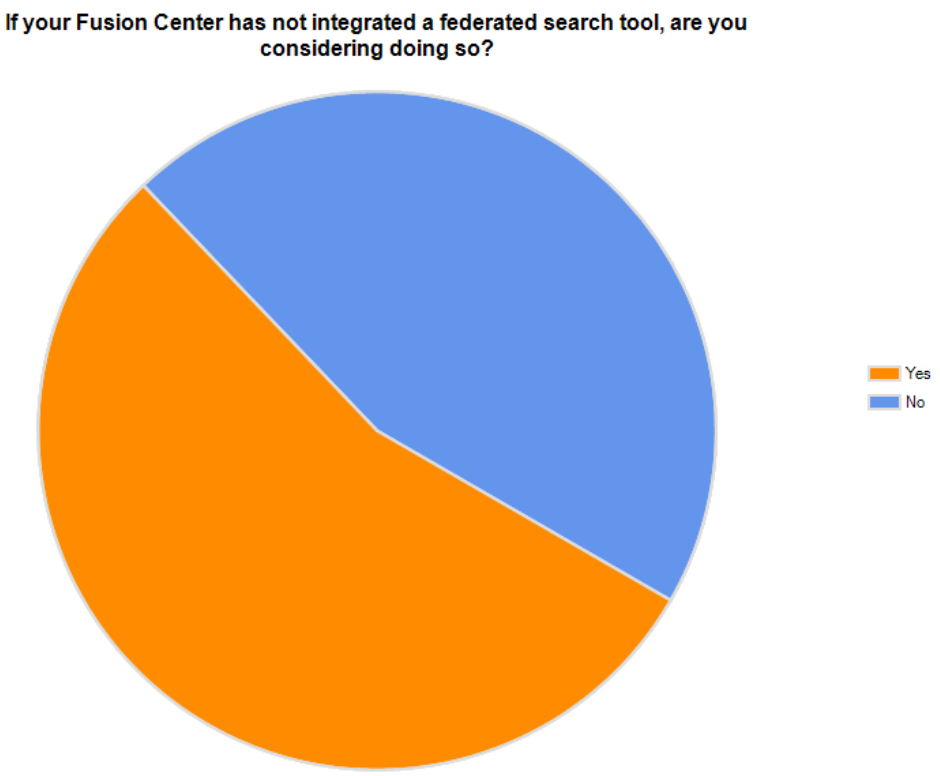

Figure 4. Fusion Centers Considering Federated Search Tool Integration (From[52])

14. Survey Question 14

If survey respondents answered "yes" to the question: "If your fusion center has not integrated a federated search tool, are you considering doing so?" This survey question asked, "Please identify the federated search tool your fusion center is considering." Of 34 responses, five answered. Of those responses, four survey respondents were unable to identify the federated search tool they are considering. This was attributed to either ongoing discussions with multiple vendors, funding had precluded any tool's designation, or the fusion center was looking at internal technologies

[52] Federated Search Tools in Fusion Centers, SurveyMonkey, last modified June 23, 2012, https://www.surveymonkey.com/s/FederatedSearchToolsinFCs.

to help bridge gaps. The remaining survey respondent indicated they had selected the "Microsoft Fusion," believed to be the Microsoft Fusion Core Solution.[53]

15. Survey Question 15

If survey respondents answered "no" to the question: "If your fusion center has not integrated a federated search tool, are you considering doing so?" This survey question asked, "Please explain why your fusion center is currently not considering the integration of a federated search tool." Of 34 responses, five answered. Of those five responses, three survey respondents offered insight into their decision-making process.

For example, one survey respondent had used a technology[54] with federated search capability for a number of years. In the survey respondent's opinion, the technology did not meet agency expectations, the intelligence analysts within that fusion center chose to utilize other tools; therefore, the agreement with the vendor was dropped. That fusion center has no immediate plans to revisit this type of technology at this time.

In another example, the survey respondent indicated the results of a federated search were not always "easily understood." That respondent indicated their fusion center leveraged a variety of tools that added more value and gleaned more "relevant information."

Finally, one survey respondent indicated that with the exception of the NSI Federated Search, which their fusion center is using, they were unaware of other federated search tool options.

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[53] Analysts International Corporation, "Microsoft's Fusion Framework Solution," 2012, http://www.analysts.com/Industries/JusticeAndPublicSafety/Pages/MicrosoftsFusionFrameworkSolution.aspx.

[54] The specific technology identified, while named in the SurveyMonkey survey response, will remain anonymous for the purposes of this analysis. The opinions of the survey respondent do not reflect the opinions of this researcher and would introduce unwanted bias into the analysis. This researcher is willing to direct inquiries regarding this analysis to the agency in question by request and with the permission of the surveyed agency.

E. SUMMARY

The individual experiences and impressions of fusion centers within the national network of fusion centers provide the basis for this analysis. In all, 77 fusion centers were surveyed. This researcher used a SurveyMonkey™ survey tool to collect data. Of those 77, this research project obtained data from 19 separate fusion centers representing approximately 24% of the national network—a modest sample. From those 19 fusion centers, 34 employees took the survey. The data was provided by fusion center directors, intelligence officers, intelligence analysts, information technologists and others.

The analysis of the qualitative survey data using a constant comparison method coupled with an open, smart practice exploration research methodology has identified a number of themes. The themes were drawn from responses to the survey questions that were tied directly to the research questions and problem space. Themes were visualized using a Mindomo concept mapping application (see Figure 5). That concept is depicted below. As you will see, the themes began to tell a story that revealed a variety of practices, and in some cases, considerable challenges.

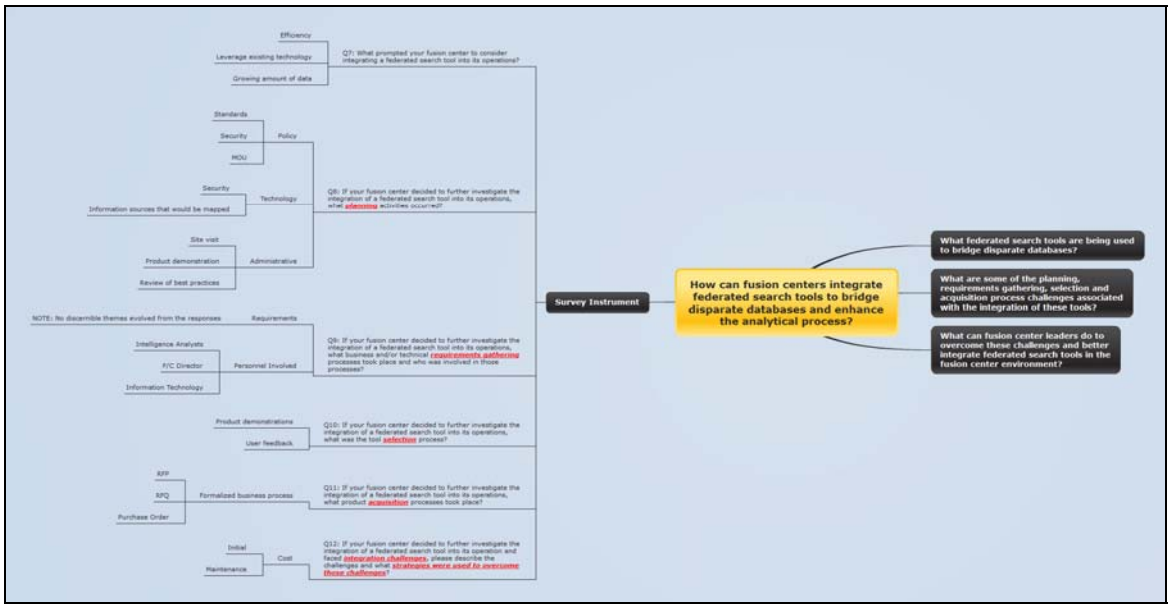

Figure 5. Mindomo Visualization of Survey Themes (From[55])

[55] Mindomo Premium Dashboard, Mindomo, last modified June 23, 2012, http://www.mindomo.com/#dashboard.

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VI. FINDINGS

A. INTRODUCTION

As outlined in Chapter V, this research utilized a constant comparison method as an analytical framework for identifying, unpacking and grouping qualitative research data derived from the survey instrument. From that analysis, a number of themes were examined. The themes were drawn from answers by fusion center personnel to the survey questions. Those survey questions map back to the research questions and problem space. The discussions that follow will stimulate thought related to the integration of federated search tools in fusion centers, providing insight into a mechanism to enhance the analytical process. The interpretations of the data will focus on the planning, requirements gathering, selection, and acquisition processes surrounding the technology integration process.

1. Theme 1: Size of Fusion Center

Of the 34 responses to the survey question, there was an equal balance of responses (13) in the 0–24 employees and 25–49 employees groupings. In the 50 or more employees classification, there were eight responses. The overall survey sample and the limited number of responses in the 50 or more employee classification are insufficient to draw any conclusions. Additional analysis, beyond the scope of this research, might consider the access to technology by different size fusion centers.

2. Theme 2: Position within the Fusion Center of Personnel Completing the Survey

Of the 34 responses to the survey question, the fusion center directors completed the survey at a rate of 52.9% over intelligence officers at 2.9%, intelligence analysts at 11.8%, information technology support at 8.8% and other fusion center staff not specifically identified by position at 23.5%. The objective of this question in the survey was to obtain answers from a diverse group of fusion center personnel involved in the planning, requirements gathering, selection, and acquisition processes of federated search tools. While this data currently speaks to individuals completing the survey, it may also

reflect those fusion center personnel involved in the above processes. It could be argued that the planning process for technology integration of federated search tools has a number of complex elements requiring a broad range of system planning, system policy and system integration knowledge and experience.

3. Theme 3: Fusion Centers Using Federated Search Tools

Of the 33 responses to the survey question, and based upon the furnished working definition of a federated search tool, fusion center personnel responded at a rate of 66.7% that their fusion center utilized such a tool. Given that 19 individual fusion centers were represented within the survey data, this researcher was surprised at the prevalence of federated search tool technology in fusion centers. While the use of federated search tools by fusion centers was an assumption of the research, it has become clear that a number of practices are in use. The goal of this research was to help identify those practices.

4. Theme 4: What Prompted Fusion Center to Consider Integration of Federated Search Tool

Of the 21 responses to the survey question, three central themes evolved—efficiency, leveraging existing technology and the growing amount of data. While it seems clear that fusion centers want to be efficient in their operations, a more remarkable discovery was the observation by fusion centers that the volume of information is posing a technical challenge. Following that logic is the notion that data is not just "free floating," but rather found in repositories or databases. Data held by one agency is not the same as data held by another. While this goes without saying, disparate databases and the data stored within presents a challenge to fusion centers—not only for access but also to enhance the analytical process.

5. Theme 5: Federated Search Tool Integration and Planning Activities

Of the 21 responses to the survey question, three central themes evolved: policy, technology and administration. In addition, within each of those central themes, a number of subthemes were discovered. Overall, subthemes of standards and security had

crossover in the policy and technology themes. It appears then that the fusion centers surveyed were concerned about how the federated search tool technology was going to interface with existing technology, how data would be accessed, and what security features were in place to maintain the integrity of the data and the database. Continuing, under the administration theme, a best practice subtheme was revealed.

While the terminology "best practice" is often used within the homeland security community when describing policies, programs or technologies, this research was designed to explore the National Network and identify "smart practices," which are systems or layered technologies involving the integration of federated search tools to enhance the analytical process. The literature review was all but mute on such practices and begs the questions how can fusion centers learn about which federated search technologies are available; how can those tools be integrated; what planning, requirements gathering, selection, and acquisition processes are involved in such an integration; what challenges exist; finally, how can those challenges be mitigated?

6. Theme 6: Federated Search Tool Integration and Requirements Gathering

Of the 20 responses to the survey question, two elements emerged—requirements and personnel. For requirements, roughly half of the fusion center personnel surveyed generically described their business/technical requirements process. Those responses ranged from mere identification of a specific technology all the way to a detailed plan to create an inter-disciplinary project team assigned to gather requirements and make recommendations. Within this element, no discernible themes were interpreted. For this research, the lack of data related to requirements gathering may present a potential gap in the overall planning and integration process for federated search tools. It has been argued throughout this research project that few, if any, resources exist to support fusion centers as they consider integration of federated search tools to enhance the analytical process.

For personnel, several subthemes came out of the analysis: Intelligence analysts, fusion center directors, and information technology support. While there was not an equal blend of expertise leveraged for requirements gathering processes, taking into

account the considerations of intelligence analysts, fusion center directors and IT support seemed promising. Intelligence analysts are charged with providing analysis—a process that often requires specialized tools. Data adds value to the analysis and federated search tools bring information from disparate sources into the process. Fusion center directors provide leadership, management, and oversight to the analytical process and can advocate on behalf of other fusion center staff as to which technologies should be considered. Lastly, IT support plays a key role in helping intelligence analysts and fusion center directors understand network architecture and how a federated search tool could be integrated within the fusion center.

7. Theme 7: Federated Search Tool Integration and Selection

Of the 20 responses to the survey question, two themes emerged: Product demonstrations and user feedback. Fusion center personnel were interested in having vendors come into their centers to demonstrate products. Fusion centers were also interested in traveling to other fusion centers to see how the federated search tool technology had been integrated. Reflecting on professional experience and observational knowledge, this researcher has experienced product demonstrations made by vendors who often have "demo" processes to accompany the prospective federated search tool. The demonstration is based upon data and data sources that are unique to the vendor and do not represent a federated search using a fully integrated tool. As such, the demonstrations have the potential to project a sense of artificiality, which fusion center personnel may not readily recognize or respect. To counter the characteristics inherent in some of those demonstrations, fusion centers should seek field visits to other centers to directly observe and evaluate federated search tools. In those environments, the face-to-face interactions between fusion center personnel permit an honest dialogue about the federated search tool; the integration of the tool; the planning, requirements gathering, selection, and acquisition processes; the challenges faced; possible mitigation strategies. That conversation is rich with evaluative content that fusion center personnel can take home with them to begin their process.

Fusion centers also rely heavily on user feedback during the selection process. That feedback loop bundles nicely with product demonstrations and fusion center site visits. Being able to evaluate what the vendor says the product can do, then seeing the product in a fusion center environment, speaking with fusion center personnel about the use of the tool in that environment, and evaluating whether or not integration would produce similar results in one's own fusion center is a considerable component of the selection process. Drawing from the requirements gathering process, being able to access IT support personnel to be involved in the vendor discussions, product demonstrations and fusion center site visits could prove extremely valuable to the overall technical feasibility of integration for the federated search tool.

8. Theme 8: Federated Search Tool Integration and Acquisition

Of the 18 responses to the survey question, one theme emerged—using a formalized business process for acquisition of a federated search tool. Three processes were highlighted by the survey respondents: Request for proposal, request for quote and purchase orders. While these terms are not new to government or private business, the underlying processes, forms and reporting timelines add some complexity to the acquisition process. In some cases, the fusion centers were coordinating acquisition with a government business office; in others, they were working directly with the vendor. In either case, drawing on knowledge or experiences from other fusion centers could benefit the acquisition process, whether it is in the form of an RFP template, standardized language unique to fusion centers, or streamlining the coordination of documents.

9. Theme 9: Federated Search Tool Integration Challenges and Mitigation Strategies

Of the 18 responses to the survey question, three themes emerged: Initial cost, maintenance and technology. Fusion center respondents overwhelmingly identified federated search tool cost and long-term software/hardware maintenance as a significant challenge. Declining federal, state and local funds translates to much tighter operating budgets. Homeland security grant funding has become more competitive, and presents a

secondary challenge to fusion centers. These sentiments resonated loudly and are consistent with this researcher's professional knowledge, observations and experiences.

Mitigation strategies, while not as clearly articulated, included developing partnerships, sharing costs and access across the networks.

Technology challenges were addressed by the respondents in terms of support, access control and security. In the end, federated search tool technology is only as successful as the support it receives, the access controls to the databases it connects and the security that is in place to ensure user and data integrity.

10. Theme 10: Fusion Centers Considering Integration of a Federated Search Tool

Of the 11 responses to the survey question, the answers were nearly split equally. For those six who answered they would consider integration of a federated search tool, only one fusion center identified the prospective tool they had considered. The other five did not identify the federated search tool for a variety of reasons. Of those five who answered they were not considering integration of a federated search tool, only three articulated their decision-making method. In one example, the tool did not meet agency expectations and was not being used by the intelligence analysts. It would be interesting to find out if in this case the planning, requirements gathering, selection, and acquisition processes used took into account product demonstrations, site visits and user feedback as part of the planning. In another case, the surveyed respondent was unaware of other federated search tools being markets beyond the federated search offered by the National Suspicious Activity Reporting Initiative process. While the literature review for this research project revealed a number of tools, it was not until after a secondary search of those tools was conducted that associations were made between the tools and various fusion centers.

B. SUMMARY

Interpretations of the analysis provide ideas and illuminate pathways for future discussion as fusion centers and their personnel consider integration of federated search tools to enhance the analytical process. This researcher believes conclusions can be

drawn from the analysis concerning “smart practices” that exist and policy that should be considered as fusion centers mature and as the national network looks to develop additional capability and capacity in an austere fiscal climate. Those conclusions, recommendations, and impressions will be outlined in the next chapter.

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VII. RECOMMENDATIONS AND CONCLUSIONS

A. RECOMMENDATIONS

The National Fusion Center Association (NFCA), a governance body for the national network of fusion centers, should take a leadership role in providing the support and guidance outlined here. It is also recommended that other interagency partners, like the U.S. Department of Homeland Security, the U.S. Department of Justice, the Program Manager's Office for the Information Sharing Environment, the IJIS Institute, the National Suspicious Activity Reporting Initiative, and others, freely contribute to the policy, planning, and technical guidance in support of federated search technologies in fusion centers—tools that will bridge disparate databases to enhance the analytical process.

The NFCA currently provides considerable support to fusion centers assisting state and major urban area fusion centers with policy development, sustainment and strategic planning, legislative outreach, interagency coordination, and technology support. This research project could readily support a "technology toolbox" for fusion centers—a repository of resources helping fusion centers identify smart practices across the network and how to begin planning, requirements gathering, selection, and acquisition processes for the integration of federated search tools or other emerging technologies. Again, those resources could include templates, tools, white papers, success stories, a vendor catalog, and access to subject matter experts. These resources could be easily compartmentalized on the NFCA secure web portal for access by all vetted personnel within fusion centers. Based on professional observations, a number of templates and documents already reside within that portal, and an area could be easily allocated to accommodate these new technical resources. It is anticipated the NFCA would fully support such an initiative and would be welcomed to use this thesis as a starting point. The NFCA has a number of industry partners and could likely leverage those partnerships to broaden the knowledge base with respect to federated search tools.

B. CONCLUSIONS

1. Summary

The intent of this thesis was to examine how fusion centers might integrate federated search tools to bridge disparate databases in an effort to enhance the analytical process. That examination included what federated search tools were being used; what planning, requirements gathering, selection, and acquisition processes were associated with such integration; if challenges were encountered during the integration process; what, if any, mitigation strategies were utilized to overcome those challenges. The research data began to tell a story through fusion center directors, intelligence officers, intelligence analysts, information-technology support personnel, and others working and interacting within fusion centers across the country. That story is rich with anecdotal and experiential insight, all of which affirm a perceived technology gap.

The literature review revealed little in the way of research or resources available to fusion centers. In particular, the literature spoke hardly at all of technologies and processes designed for fusion centers to bridge disparate databases. Only when the research went to secondary and tertiary resources that private sector vendor information began to surface regarding technologies that could be found within the homeland security ecosystem. The vendor materials, while rich in technical specifications and capabilities, minimally addressed such fundamental factors such as planning, requirements gathering, selection, and acquisition processes to technology integration. That void created a gap for this research project.

Using a hybrid research approach blending open smart practice exploration through Appreciative Inquiry and a semi-structured survey instrument, the research project set forth to better understand how fusion centers might integrate federated search tools to bridge disparate databases to enhance the analytical process. The national network of fusion centers was surveyed with the intent of bridging the literature gap and acquiring knowledge spanning theory and practice. The research project anticipated that a number of fusion centers were utilizing technology with federated search capabilities. That assumption was affirmed through the secondary canvass of literature. The project

also expected that "smart practices" existed in fusion centers across the network—technologies, policies, or procedures that were notable and should be recognized.

The analysis combined an inductive approach with a constant comparison method to identify and draw attention to themes, or islands of impressions, experiences, and knowledge offered by fusion center personnel through their answers to the survey questions. A mapping visualization of those themes was constructed using a word mapping software tool, Mindomo. The intent of this mapping was to visualize common words, phrases, or thoughts drawn from the content of the answers for the purpose of making sense of any relationships within and between the data. The interpretation of the analysis identified a number of themes and perceived relationships internal and external to those themes.

Additionally, the findings suggest that fusion center personnel are concerned with the initial and ongoing cost of federated search tool technology; how the technology will integrate in their fusion centers; whether or not the technology will meet the increasing volume of data; will the product demonstrations, fusion center site visits and user feedback be sufficient to evaluate the effectiveness or appropriateness of the federated search tool; will the subject matter expertise of fusion center personnel be adequate for the collaborative planning process. These interpretations from the analysis reflect a number of pragmatic issues facing fusion centers today.

C. LIMITATIONS

Early on, this research identified a number of technical boundaries. For example, the identity of federated search tools (i.e., actual software or hardware branded by a particular commercial vendor), design of that federated search tool, security features layered between the federated search technology and a fusion center's network environment, and the integration of the federated search tool into the fusion center were beyond the scope of this research project. The topics above each represent potential research projects.

A number of assumptions were also made leading into this research. Those assumptions included that fusion centers were using federated search tools, the tools had

been integrated into the fusion center's network environment and federated searches were enhancing the analytical process. In addition, the research assumed that fusion centers, like the Wisconsin Statewide Information Center, were struggling with the prospect of multiple disconnected databases, manual inquiries of those databases and the increasing margin of human error.

With respect to federated search tool cost efficiency or cost effectiveness, this research could not address the element of time or the ratio of success without introducing a measurement tool into the research methodology. While these elements pose interesting issues related to the analytical process, the research focused on the challenges of the planning, requirements gathering, selection, and acquisition processes and the strategies used to overcome those challenges. It was anticipated that fusion centers would find considerable value in learning about the complexity of system planning and how those planning elements could be applied to the integration of a federated search technology.

The findings also suggest that the problem space identified within the Wisconsin Statewide Information Center are not unique and can be generalized to other fusion centers. While many of the fusion centers surveyed had already acquired federated search tool technology, the majority of the survey respondents either had not been involved in the planning, requirements gathering, selection, and acquisition process or had not considered these system-planning steps in advance of their purchase. This research project illustrates some of the concerns that fusion centers have, defines some of the challenges they faced during the integration of complex technologies and hopefully stresses the importance of systems thinking and planning when developing a project. In conclusion, the research should also reinforce the notion that proven successes, smart practices and other innovations can exist but must be shared to be valuable.

D. RELEVANCE

It seems clear that additional support and resources are needed for fusion centers—technical guidance that currently does not exist. That support could take many forms. When considering the planning, requirements gathering, selection, and acquisition

processes related to the integration of a federated search tool, the fusion center network would likely benefit from policy, planning and technical guidance. Template policies developed in concert with fusion centers and interagency partners could help define the importance of federated search tool technology, its role in the fusion center environment, project development, project planning, detailed descriptions on the relevance of advance planning, defining specific equipment requirements, the selection process, and acquisition phases. Beyond policy, the research suggests that some fusion centers would benefit from resources that detail the planning process from a procedural perspective. Those planning resources could be project management tools, how to develop an integration plan, what personnel are required for planning and implementation, what platforms exist, what technical specifications will be considered, and how to effectively interface with information technology (IT) and vendor technical staff to ensure proper delivery of the federated search tool. Lastly, technical guidance could be delivered to fusion centers for identifying what technologies exist, what are the key attributes of those technologies, what vendors market those technologies, the review of integration white papers and success stories, and connecting fusion centers that do not have federated search tool technology to those who do.

In a global economy, the technology marketplace is flooded with solutions. Helping fusion center directors, intelligence officers, intelligence analysts, and IT support staff navigate that market to identify suitable solutions for their centers should be a top priority given the current rate of evolution of technology and fusion centers.

E. FUTURE RESEARCH

This thesis represents one small island within a much larger academic environment. As homeland security is redefined, as fusion centers mature within the information sharing environment, as threats adapt and as technology advances to meet the needs of the world, the nation and the enterprise, other islands will emerge. These islands will likely symbolize emerging threats, trends, or technologies. In the area of technology spanning predictive intelligence, geo-spatial systems, bio-metric analytics, unmanned aerial vehicle surveillance platforms, social media, mobile delivery of law enforcement

systems, and other layered next generation technologies, many will be ripe for academic exploration. Protecting the nation is a complex problem. Technology to support those protective efforts is equally complex. Only through education, training, experience, and the sharing of knowledge can homeland security practitioners adapt to this complex ecosystem.

APPENDIX. SURVEY INSTRUMENT

Survey Introduction, Goal and Instructions

Introduction/Background:

Greetings and thank you for your time and consideration. My name is Jody Wormet and I am enrolled in the Center for Homeland Defense and Security (CHDS) at the Naval Postgraduate School in Monterey, California. I am working on my Master's thesis and I expect to graduate in September 2012. My thesis research centers on fusion centers and more specifically, the use and integration of federated search tool technology to enhance the analytical process.

Goal:

The results of this survey will provide me with information currently unavailable in open sources, bridge perceived research gaps, and add depth to the research. It is the intention of this research to analyze and evaluate the data reported in aggregate in an effort to uncover any smart practices. Unless otherwise noted, individual fusion centers will not be identified in the findings.

Instructions:

The survey can be completed in approximately thirty (30) minutes and submitted electronically when finished. If you have any questions or problems with the survey tool, please contact me at 608-469-9816 or by e-mail at wormetjr@doj.state.wi.us.

Thank you for participating in the survey.

Surveyed Fusion Center Demographics

1. What is the name of your fusion center (OPTIONAL)?

***2. How many employees work in your fusion center?**

- ◯ 0-24
- ◯ 25-49
- ◯ 50 or more

3. Contact information for individual completing the survey (OPTIONAL)

Name:

Email Address:

Phone Number:

4. What is the title of the individual completing the survey (OPTIONAL)?

***5. What is the position within the fusion center of the individual completing the survey?**

- ◯ Director
- ◯ Intelligence Officer
- ◯ Intelligence Analyst
- ◯ Information Technology (IT) Support
- ◯ Other (please specify)

Federated Search Tool Definition

For the purposes of this survey, the following working definition of "federated search tool" will be used as a frame of reference:

A technology that "enables users to search multiple information sources simultaneously through one search query." Ideally, the search has a single username/password login combination; the search returns data in a uniform format; and the search is able to return data from internal, external, networked, and public Internet sites. There is little variance in the definition of a federated search, whether it is discussed as an "engine" or as a "tool."

***6. Based on the above definition, does your Fusion Center use a tool with federated search capability that was designed to connect and permit searching across data sources?**

- ◯ Yes
- ◯ No

Process Integration

***7. You chose yes to Question 6. Please answer the following:**

What prompted your Fusion Center to consider integrating a federated search tool into its operations?

***8. You chose yes to Question 6. Please answer the following:**

If your Fusion Center decided to further investigate the integration of a federated search tool into its operations, what planning activities occurred?

Process Integration

***9. You chose yes to Question 6. Please answer the following:**

If your Fusion Center decided to further investigate the integration of a federated search tool into its operations, what business and/or technical requirements gathering processes took place and who (roles) was involved in those processes?

***10. You chose yes to Question 6. Please answer the following:**

If your Fusion Center decided to further investigate the integration of a federated search tool into its operations, what was the tool selection process?

Process Integration

***11. You chose yes to Question 6. Please answer the following:**

If your Fusion Center decided to further investigate the integration of a federated search tool into its operations, what product acquisition processes took place?

***12. If your Fusion Center decided to further investigate the integration of a federated search tool into its operation and faced integration challenges, please describe the challenges and what strategies were used to overcome those challenges?**

Other Integration Considerations

13. If your Fusion Center has not integrated a federated search tool, are you considering doing so?

- ◯ Yes
- ◯ No

Other Integration Options

***14. You chose yes to Question 7. Please identify the federated search tool your fusion center is considering.**

Other Integration Options

***15. You chose no to Question 7. Please explain why your fusion is currently not considering the integration of a federated search tool.**

Thank you

Thank you again for your time and participation.

Should you have any questions, you may reach me at 608.469.9816 or wormetjr@doj.state.wi.us

Have a great day,

Jody Wormet

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